

Notice of Allowability

Application No.

10/701,324

Examiner

Joshua L. Pritchett

Applicant(s)

GRIER ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed July 23, 2007.
2. ☒ The allowed claim(s) is/are 1-119.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

EXAMINER'S AMENDMENT

This action is in response to Amendment filed July 23, 2007. Claims 1, 10, 34, 61 and 116 were amended and claim 120 was cancelled as requested by the applicant.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Jean Edwards on August 3, 2007.

The application has been amended as follows:

Claim 15 A method of forming and monitoring a plurality of movable optical traps comprising:

generating a focused beam of light; directing the focused beam of light at a phase patterning optical element to form a plurality of beamlets emanating from the phase patterning optical element having a variable optical surface, each beamlet having a phase profile;

converging the beamlets emanating from the phase patterning optical element at a position between the phase patterning optical element and only a single transfer lens with the phase patterning optical element;

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directing the beamlets emanating from the phase patterning optical element through a single transfer lens to overlap the beamlets at a surface of a beam splitter and to create two streams of beamlets, the beam splitter reflecting the first stream of beamlets to the back aperture of a focusing lens and reflecting the second stream of beamlets to form an optical data stream; and

converging the beamlets emanating from the focusing lens to form a plurality of optical traps.

Claim 45 An apparatus to produce and monitor at least two optical traps comprising:

a phase patterning optical element for receiving a focused beam of light and diffracting it into at least two beamlets, each beamlet having a phase profile;

a virtual lens encoded in the phase patterning optical element for converging each beamlet emanating from the phase patterning optical element at a position between the phase patterning optical element and only a single transfer lens;

the single transfer lens for directing the beamlets emanating from the phase patterning optical element to overlap at a back aperture of a focusing lens; and

a beam splitter for receiving the beamlets emanating from the single transfer lens to create two streams of beamlets, then to reflect the first stream of beamlets to the back aperture of the focusing lens and reflect the second stream of beamlets to form an optical data stream;

wherein the focusing lens converges each beamlet emanating from the beam splitter to form at least two optical traps.

Claim 60 An apparatus to produce and monitor a plurality of optical traps comprising:

a dynamic diffractive optical element for receiving a single laser beam and diffracting it into at least two beamlets, each beamlet having a phase profile;

a Virtual lens encoded in the diffractive optical element for converging the beamlets emanating from the phase patterning optical element at a position between the phase patterning optical element and only a single transfer lens;

the single transfer lens for directing the beamlets emanating from the phase patterning optical element to overlap at a back aperture of a focusing lens; and

the beam splitter for receiving the beamlets emanating from the single transfer lens to create two streams of beamlets, then to reflect the first stream of beamlets to the back aperture of the focusing lens and reflect the second stream of beamlets to form an optical data stream;

wherein the focusing lens converges each beamlet emanating from the beam splitter to form at least two optical traps.

Claim 64 The system of claim [64] 61 wherein the phase patterning optical element has a variable optical surface.

Claim 78 A system for manipulating small particles using optical traps comprising:

a plurality of small particles;

a light source for producing a focused beam of light;

a focused beam of light;

a phase patterning optical element which receives the focused beam of light and diffracts it into at least two beamlets, each beamlet having a phase profile;

a virtual lens encoded in the phase patterning optical element which converges each beamlet emanating from the phase patterning optical element at a position between the phase patterning optical element and only a single transfer lens;

a beam splitter for receiving the beamlets emanating from the phase patterning optical element and creating two streams of beamlets and for reflecting the first stream of beamlets to overlap the back aperture of a focusing lens and reflecting the second stream of beamlets to form an optical data stream;

the single transfer lens disposed between the phase patterning optical element and the focusing lens through which each beamlet passes and is overlapped at the back aperture of the focusing lens;

at least two optical traps each able to manipulate one of the plurality of small particles;
and

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a monitor for the optical data stream.

Claim 79 The system of claim [80] 78 wherein the single transfer lens is movable.

Claim 108 An optical system for monitoring and manipulating small particles comprising:

a source of a single beam of focused energy;

a single beam of focused energy;

a dynamic diffractive optical element;

a plurality of converged beamlets produced by directing the single beam at the optical element;

a focusing lens;

a beam splitter placed in the path of the converged beamlets creating two streams of beamlets and reflecting the first stream of beamlets to overlap the back aperture of the focusing lens and reflecting the second stream of beamlets to form an optical data stream;

a movable only single transfer lens disposed between the optical element and the beam splitter to direct that beamlets to the beam splitter;

at least two optical traps formed by the convergence of the beamlets through the focusing lens; and

a monitor for the optical data stream.

Claims 9, 15-33, 45-60, 76, 77 and 78-115 directed to allowable subject matter. Pursuant to the procedures set forth in MPEP § 821.04(B), all the withdrawn claims are hereby rejoined and fully examined for patentability under 37 CFR 1.104.

Because all claims previously withdrawn from consideration under 37 CFR 1.142 have been rejoined, **the restriction requirement as set forth in the Office action mailed on January 7, 2005 is hereby withdrawn.** In view of the withdrawal of the restriction requirement as to the rejoined inventions, applicant(s) are advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once the restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

The following is an examiner's statement of reasons for allowance:

Regarding claims 1, 10, 15, 34, 45, 60, 61, 78, 108 and 116, the prior art fails to teach or suggest generating a light beam directing the light beam through a phase patterning optical

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element (a dynamic diffractive optical element is considered to be a subset of a phase patterning optical element) converging beamlets and directed the beamlets through only a single transfer lens and a focusing lens to form optical traps.

The applicant presented the examiner with case law to show that the interpretation of only a single transfer lens must be limited to only a single lens despite the use of the transitional term "comprising." The prior art of record has two lenses. It is not possible to remove one of the lenses without destroying the prior art reference since the two lenses work in concert with one another.

The remaining claims depend from claims 1, 10, 15, 34, 45, 61, 78, 108 and 116 and are allowable for the same reasons.

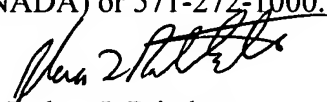
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua L. Pritchett whose telephone number is 571-272-2318. The examiner can normally be reached on Monday - Friday 7:00 - 3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Joshua L Pritchett
Examiner
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